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| APPLICATION NO.                      | FILING DATE | FIRST NAMED INVENTOR       | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|--------------------------------------|-------------|----------------------------|---------------------|------------------|
| 10/720,752                           | 11/25/2003  | Emiel Jozef Melanie Eussen | 081468-0306993      | 2765             |
| 909                                  | 7590        | 01/12/2006                 | EXAMINER            |                  |
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|                                      |             |                            |                     | ART UNIT         |
|                                      |             |                            |                     | PAPER NUMBER     |
|                                      |             |                            |                     | 2877             |

DATE MAILED: 01/12/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

|                              |                 |               |
|------------------------------|-----------------|---------------|
| <b>Office Action Summary</b> | Application No. | Applicant(s)  |
|                              | 10/720,752      | EUSSEN ET AL. |
| Examiner                     | Art Unit        |               |
| Samuel A. Turner             | 2877            |               |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
  - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
  - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) Responsive to communication(s) filed on 15 April 2004.
- 2a) This action is FINAL.                    2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) Claim(s) \_\_\_\_\_ is/are allowed.
- 6) Claim(s) 1-24 is/are rejected.
- 7) Claim(s) \_\_\_\_\_ is/are objected to.
- 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on 25 November 2003 is/are: a) accepted or b) objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) All    b) Some \* c) None of:
  1. Certified copies of the priority documents have been received.
  2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                    | Paper No(s)/Mail Date: _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date: _____ | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
|   | 6) <input type="checkbox"/> Other: _____                                    |

## DETAILED ACTION

### *Title*

The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

### *Drawings*

The drawings are objected to because figures 1, 2, and 3a must be labeled as prior art; and the figures are informal due to hand drawn numerals. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application.

### Replacement Drawing Sheets

Drawing changes must be made by presenting replacement sheets which incorporate the desired changes and which comply with 37 CFR 1.84. An explanation of the changes made must be presented either in the drawing amendments section, or remarks, section of the amendment paper. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). A replacement sheet must include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of the amended drawing(s) must not be labeled as "amended." If the changes to the drawing figure(s) are not accepted by the examiner, applicant will be notified of any required corrective action in the next Office action. No further drawing submission will be required, unless applicant is notified.

Identifying indicia, if provided, should include the title of the invention, inventor's name, and application number, or docket number (if any) if an application number has not been assigned to the application. If this information is provided, it must be placed on the front of each sheet and within the top margin.

### Annotated Drawing Sheets

A marked-up copy of any amended drawing figure, including annotations indicating the changes made, may be submitted or required by the examiner. The annotated

drawing sheet(s) must be clearly labeled as “Annotated Sheet” and must be presented in the amendment or remarks section that explains the change(s) to the drawings.

#### **Timing of Corrections**

Applicant is required to submit acceptable corrected drawings within the time period set in the Office action. See 37 CFR 1.85(a). Failure to take corrective action within the set period will result in ABANDONMENT of the application.

If corrected drawings are required in a Notice of Allowability (PTOL-37), the new drawings MUST be filed within the THREE MONTH shortened statutory period set for reply in the “Notice of Allowability.” Extensions of time may NOT be obtained under the provisions of 37 CFR 1.136 for filing the corrected drawings after the mailing of a Notice of Allowability.

#### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 8, 16, and 23 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

With regard to claims 8, 16, and 23; the phrase “respective first reference beams and respective first measuring beams” is confusing because claims 3, 11, and 18 respectively, only has antecedent basis for “a first measuring beam and a first reference beam”.

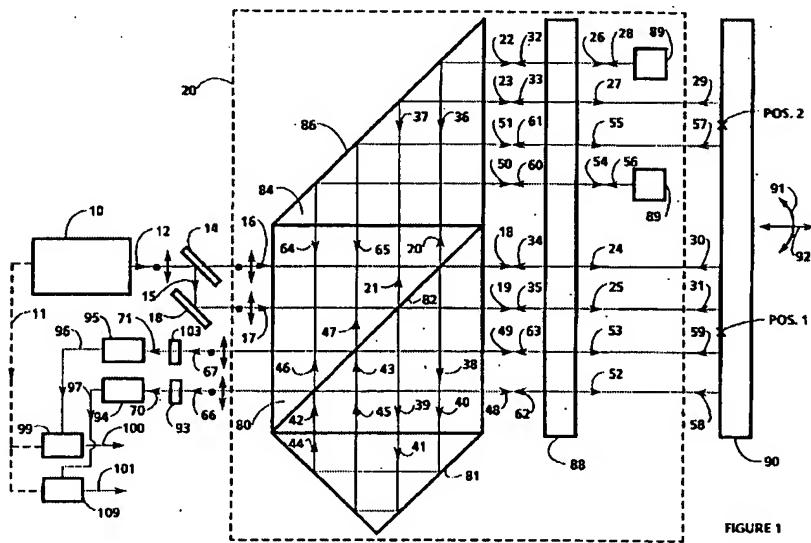
*Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-4, and 9 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Sommargren(4,859,066).



With regard to claim 1, Sommargren teaches an interferometer system(20) for measuring displacement, along at least two directions within a three dimensional system of coordinates, of an object in a plane substantially parallel to a two dimensional plane, said interferometer system comprising:

a plane mirror interferometer system(14,80,81,84,89,90);  
a differential plane mirror interferometer system(18,80,81,84, 90); and  
a beam splitter arrangement(80) configured to split a radiation beam(16)  
associated with said plane mirror interferometer system and a radiation beam(17)  
associated with said differential plane mirror interferometer system into respective  
measuring beams(18,19) and respective reference beams(20,21).

As to claim 2, wherein said beam-splitter arrangement includes a  
transparent body(80) having a beam-splitting surface(82) and a first reflector(84)  
which is integrally connected to said transparent body and which has a reflective  
surface(86) that extends substantially parallel to the beam splitting surface.

With regard to claim 3, Sommargren teaches an interferometer system(20)  
for measuring displacement along at least two directions in an XYZ system of co-  
ordinates, of an object in a plane substantially parallel to an XY plane, said  
interferometer system comprising:

at least one measuring mirror(90) fixedly connected to said object and  
comprising a plurality of measuring mirror areas;

at least one reference mirror(89) comprising at least one reference mirror  
area;

a beam generator(14,18,80,81,84) configured to generate a plurality of  
radiation beams(16,17), said beam generator comprising a beam-splitter block(80)  
having a beam splitting surface(82);

a plurality of radiation-sensitive detectors(94,95) configured to convert radiation beams(66,67) reflected towards said detectors into electric measuring signals;

wherein said beam splitter block(80) is configured to split at least one first beam(16) of said plurality of radiation beams into a first measuring beam(18) and a first reference beam(20),

said first reference beam(20) only being reflected by one or more first reference mirrors(89) located in a fixed position with respect to said beam-splitter block(80),

said first measuring beam(18) being reflected by a first measuring mirror area(at reflection 18-30) of said plurality of measuring mirror areas, and

wherein said beam splitting surface(82) is configured to split at least one second beam(17) of said plurality of radiation beams into a second measuring beam(19) and a second reference beam(21),

said second measuring beam(19) being reflected by a second measuring mirror area(at reflection 19-31) of said plurality of measuring mirror areas, and

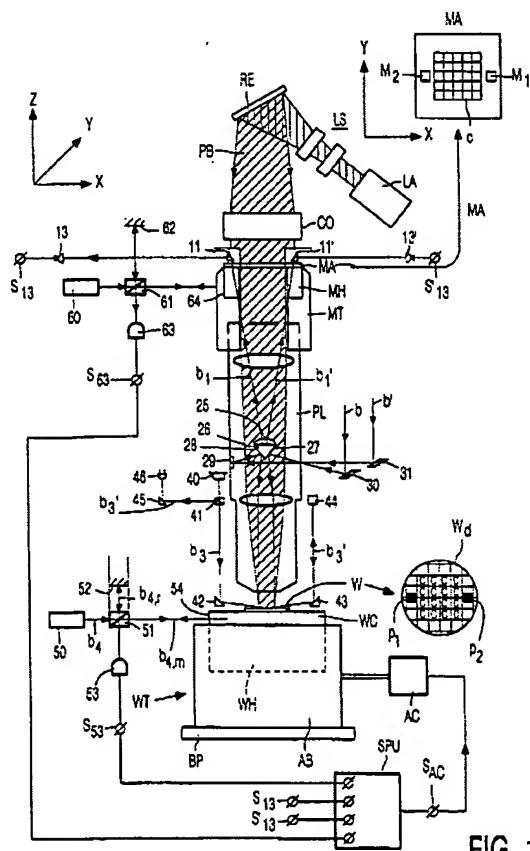
said second reference beam(21) being reflected by a first reflector(86) that is fixedly positioned with respect to said beam-splitter block(80) and by

at least one third mirror area(at reflection 23-29), which is movable with respect to said beam-splitter block(80).

As to claim 4, wherein said at least one third mirror area(at reflection 23-29) comprises a third measuring mirror area fixed to said object(90).

As to claim 9, wherein said beam-splitter block(80) comprises a transparent body having a beam-splitting surface(82) and a first reflector(84) which is integrally connected to said transparent body and which has a reflective surface(86) that extends substantially parallel to the beam splitting surface.

Claims 18-24 are rejected under 35 U.S.C. 102(b) as being anticipated by Loopstra et al(6,020,964).



**FIG. 1**

With regard to claim 18, Loopstra et al teach a device manufacturing method comprising:

providing a substrate(W);

providing a beam of radiation using an illumination system(LA);

using patterning device(MA) to impart beam of radiation with a pattern in its cross-section; and

projecting(PL) said patterned beam of radiation onto a target portion of the substrate,

wherein a position of at least one of said patterning device and said substrate is determined by an interferometer system(column 10, lines 27-46).

The remaining limitations of claim 18, as well as claims 19-24, are structural limitations having no definite method steps directe3d to a manufacturing method and it has been held that to be entitled to weight in method claims, the recited structural limitations therein must affect the method in a manipulative sense, and not to amount to the mere claiming of a use of a particular structure. Ex parte Pfeiffer, 1962 C.D. 408 (1961).

*Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 5-8, and 10-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sommargren(4,859,066) in view of Loopstra et al(6,020,964).

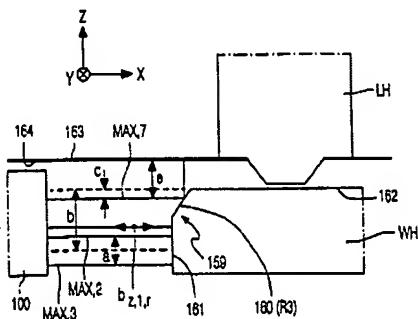


FIG. 5

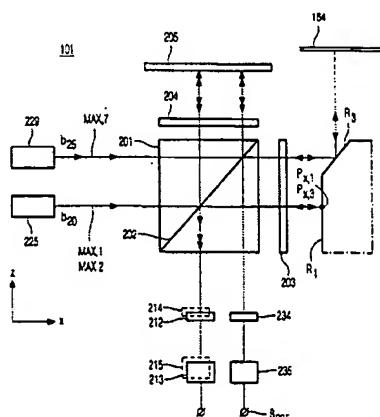


FIG. 11

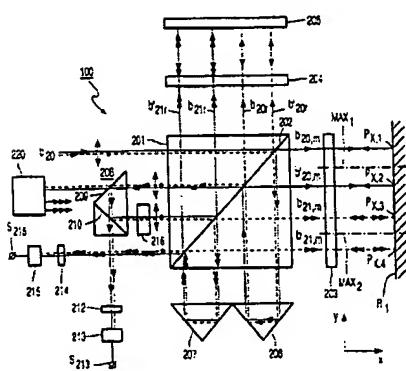


FIG. 10

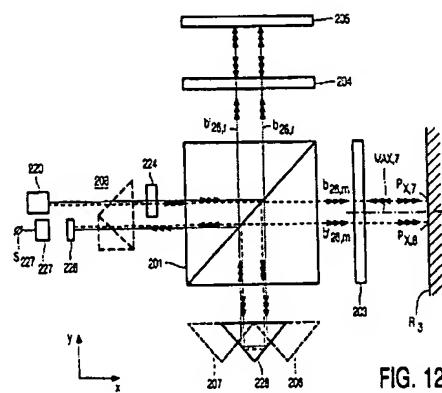


FIG. 12

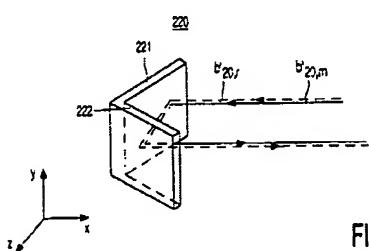


FIG. 13

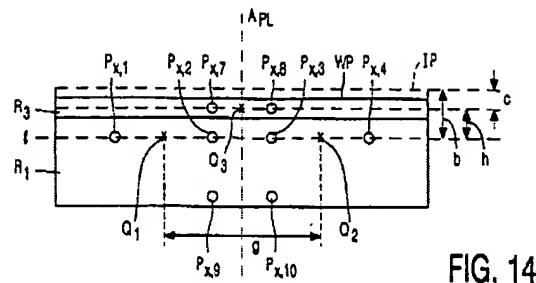


FIG. 14

As to claim 5, Sommargren fails to teach "a second reflector fixed to said object and a second reference mirror area located in a fixed position with respect to said beam-splitter block".

Loopstra et al teach a second reflector fixed to said object(160) and a second reference mirror(164) area located in a fixed position with respect to said beam-splitter block, wherein said second reflector is arranged to direct said second reference beam towards said second reference mirror area.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to replace the section of mirror from which beams 27 and 55 reflect with the angled reflector of Loopstra in order to measure displacement along a different (angular) axis.

As to claim 6, Sommargren fails to teach "a fourth mirror area which is fixed to a second object, which is movable with respect to the beam-splitter block".

Loopstra et al teach a fourth mirror area(160) which is fixed to a second object(164), which is movable with respect to the beam-splitter block.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to replace the section of mirror from which beams 27 and 55

reflect with the angled reflector of Loopstra in order to measure displacement along a different (Z) axis.

As to claim 7, Sommargren fails to teach “wherein said plurality of radiation beams comprises at least three first radiation beams occupying more than one plane and at least one second radiation beam in a position between two of said at least three first radiation beams”.

Loopstra et al teach generating a plurality of beams(figure 10-12, b<sub>20</sub>) which occupy more than one plane(figure 14, P<sub>x,1</sub>-P<sub>x,10</sub>) and a second radiation beam(figure 11, b<sub>25</sub>) in a position between two of said at least three first radiation beams(figure 14; P<sub>x,7</sub>,P<sub>x,8</sub>)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to generate the number of beams needed, as found in Loopstra, in order to measure displacement along the desired number of different (X,Z, $\varphi_z$ , $\varphi_y$ ) axes.

As to claim 8, Sommargren fails to teach “at least three first radiation beams occupying more than one plane and at least one second radiation beam in a position outside a polygon volume formed by connecting respective first reference beams and respective first measuring beams”.

Loopstra et al teach generating a plurality of beams(figure 10-12, b<sub>20</sub>) which occupy more than one plane(figure 14, P<sub>x,1</sub>-P<sub>x,10</sub>) and a second radiation beam(figure

11, b<sub>25</sub>) in a position between two of said at least three first radiation beams(figure 14; P<sub>x,7</sub>,P<sub>x,8</sub>)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to generate the number of beams needed, as found in Loopstra, in order to measure displacement along the desired number of different (X,Z, $\phi_z,\phi_y$ ) axes.

With regard to claim 10, Sommargren fails to teach a lithographic apparatus comprising: an illumination system; a support structure; a substrate holder; and a projection system. But does teach an interferometer system for measuring displacement of at least one of said patterning device and said substrate, wherein said interferometer system comprises,

a plane mirror interferometer system(14,80,81,84,89,90);  
a differential plane mirror interferometer system(18,80,81,84, 90); and  
a beam splitter arrangement(80) configured to split a radiation beam(16)  
associated with said plane mirror interferometer system and a radiation beam(17)  
associated with said differential plane mirror interferometer system into respective  
measuring beams(18,19) and respective reference beams(20,21).

a beam-splitter block(80) containing at least one beam splitter(82), at  
least one mirror(86), and at least one retro-reflector(81), such that said beam  
splitter block is configured to split a beam(16) associated with said plane  
mirror interferometer system(14,80,81,84,89,90) and a beam(17) associated

with said differential plane mirror interferometer system(18,80,81,84, 90) into respective measuring beams(18,19) and respective reference beams(20,21).

Loopstra et al teach that displacement interferometers, such as found in Sommargren, are used in lithographic systems.

It would have been obvious to one of ordinary skill in the art at the time the invention was made apply the displacement apparatus of Sommargren in a known lithographic system.

With regard to claim 11, Sommargren fails to teach a lithographic apparatus comprising: an illumination system; a support structure; a substrate holder; and a projection system. But does teach an interferometer system for measuring displacement of at least one of said patterning device and said substrate, wherein said interferometer system comprises,

at least one measuring mirror(90) fixedly connected to said object and comprising a plurality of measuring mirror areas;

at least one reference mirror(89) comprising at least one reference mirror area;

a beam generator(14,18,80,81,84) configured to generate a plurality of radiation beams(16,17), said beam generator comprising a beam-splitter block(80) having a beam splitting surface(82);

a plurality of radiation-sensitive detectors(94,95) configured to convert radiation beams(66,67) reflected towards said detectors into electric measuring signals;

wherein said beam splitter block(80) is configured to split at least one first beam(16) of said plurality of radiation beams into a first measuring beam(18) and a first reference beam(20),

said first reference beam(20) only being reflected by one or more first reference mirrors(89) located in a fixed position with respect to said beam-splitter block(80),

said first measuring beam(18) being reflected by a first measuring mirror area(at reflection 18-30) of said plurality of measuring mirror areas, and

wherein said beam splitting surface(82) is configured to split at least one second beam(17) of said plurality of radiation beams into a second measuring beam(19) and a second reference beam(21),

said second measuring beam(19) being reflected by a second measuring mirror area(at reflection 19-31) of said plurality of measuring mirror areas, and

said second reference beam(21) being reflected by a first reflector(86) that is fixedly positioned with respect to said beam-splitter block(80) and by at least one third mirror area(at reflection 23-29), which is movable with respect to said beam-splitter block(80).

As to claim 12, Sommargren teaches wherein said at least one third mirror area(at reflection 23-29) comprises a third measuring mirror area(at reflection 23-29) fixed to said object(90).

As to claim 17, Sommargren does teach wherein said beam-splitter block comprises a transparent body(80) having a beam-splitting surface(82) and a first reflector(84) which is integrally connected to said transparent body and which has a reflective surface(86) that extends substantially parallel to the beam splitting surface.

Loopstra et al teach that displacement interferometers, such as found in Sommargren, are used in lithographic systems.

It would have been obvious to one of ordinary skill in the art at the time the invention was made apply the displacement apparatus of Sommargren in a known lithographic system.

As to claim 13, Sommargren fails to teach “a second reflector fixed to said object and a second reference mirror area located in a fixed position with respect to said beam-splitter block”.

Loopstra et al teach a second reflector fixed to said object(160) and a second reference mirror(164) area located in a fixed position with respect to said beam-splitter block, wherein said second reflector is arranged to direct said second reference beam towards said second reference mirror area.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to replace the section of mirror from which beams 27 and 55 reflect with the angled reflector of Loopstra in order to measure displacement along a different (angular) axis.

As to claim 14, Sommargren fails to teach “at least one third mirror area comprises a fourth mirror area which is fixed to a second object, which is movable with respect to the beam-splitter block”.

Loopstra et al teach a second reflector fixed to said object(160) and a second reference mirror(164) area located in a fixed position with respect to said beam-splitter block, wherein said second reflector is arranged to direct said second reference beam towards said second reference mirror area.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to replace the section of mirror from which beams 27 and 55 reflect with the angled reflector of Loopstra in order to measure displacement along a different (Z) axis.

As to claim 15, Sommargren fails to teach “wherein said plurality of radiation beams comprises at least three first radiation beams occupying more than one plane and at least one second radiation beam in a position between two of said at least three first radiation beams”.

Loopstra et al teach generating a plurality of beams(figures 10-12, b<sub>20</sub>) which occupy more than one plane(figure 14, P<sub>x,1</sub>-P<sub>x,10</sub>) and a second radiation beam(figure

11, b<sub>25</sub>) in a position between two of said at least three first radiation beams(figure 14; P<sub>x,7</sub>,P<sub>x,8</sub>)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to generate the number of beams needed, as found in Loopstra, in order to measure displacement along the desired number of different (X,Z, $\varphi_z$ , $\varphi_y$ ) axes.

As to claim 16, Sommargren fails to teach “wherein said plurality of radiation beams comprises at least three first radiation beams occupying more than one plane and at least one second radiation beam in a position outside a polygon volume formed by connecting respective first reference beams and respective first measuring beams”.

Loopstra et al teach generating a plurality of beams(figures 10-12, b<sub>20</sub>) which occupy more than one plane(figure 14, P<sub>x,1</sub>-P<sub>x,10</sub>) and a second radiation beam(figure 11, b<sub>25</sub>) in a position between two of said at least three first radiation beams(figure 14; P<sub>x,7</sub>,P<sub>x,8</sub>)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to generate the number of beams needed, as found in Loopstra, in order to measure displacement along the desired number of different (X,Z, $\varphi_z$ , $\varphi_y$ ) axes.

*Conclusion*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Samuel A. Turner whose phone number is 571-272-2432.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory J. Toatley, Jr., can be reached on 571-272-2800 ext. 77.

The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Samuel A. Turner  
Primary Examiner  
Art Unit 2877